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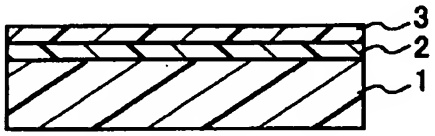
(54)【発明の名称】　複合位相差板、円偏光板及び液晶表示装置、有機ＥＬ表示装置

(57)【要約】
【課題】　全可視光域など、広い波長域にわたって１／４波長の位相差を与えることができ、高性能、かつ低コストで容易に製造可能な複合位相差板、円偏光板及びそれを用いた広視野角液晶表示装置、有機ＥＬ表示装置を提供する。
【解決手段】　透明ポリマーフィルムを延伸してなる、実質的に可視光の１／４波長又は１／２波長の位相差値を有する位相差フィルム上に、液晶性化合物からなる、実質的に可視光の１／４波長の位相差値を有する複屈折層と、実質的に可視光の１／２波長の位相差値を有する少なくとも１層の複屈折層とを形成してなる複合位相差板。



【特許請求の範囲】
【請求項１】　透明ポリマーフィルムを延伸してなる、実質的に可視光の１／４波長又は１／２波長の位相差値を有する位相差フィルム上に、液晶性化合物からなる、実質的に可視光の１／４波長の位相差値を有する複屈折層と、実質的に可視光の１／２波長の位相差値を有する少なくとも１層の複屈折層とが形成されていることを特徴とする複合位相差板。
【請求項２】　前記位相差フィルムが、光弾性係数５０×１０$^{-13}$m^2／Ｎ以下のポリマーフィルムを延伸したものである請求項１に記載の複合位相差板。
【請求項３】　請求項１又は２に記載の複合位相差板と偏光板との積層体からなることを特徴とする円偏光板。
【請求項４】　前記偏光板が、前記複合位相差板の１／２波長の位相差値を有する位相差フィルム又は複屈折層に積層されている請求項３に記載の円偏光板。
【請求項５】　前記複屈折層における波長分散値Δｎ$_{400}$／Δｎ$_{550}$（但し、Δｎ$_{400}$は波長４００ｎｍにおける複屈折率、Δｎ$_{550}$は波長５５０ｎｍにおける複屈折率である）が、前記位相差フィルムにおける前記波長分散値よりも大きい請求項３又は４に記載の円偏光板。
【請求項６】　前記偏光板の透過軸と前記位相差フィルムの遅相軸が、実質的に平行または直交関係にある請求項３～５のいずれかに記載の円偏光板。
【請求項７】　請求項１又は２に記載の複合位相差板を、液晶セルの少なくとも片側に配置したことを特徴とする液晶表示装置。
【請求項８】　請求項３～６のいずれかに記載の円偏光板を、液晶セルの少なくとも片側に配置したことを特徴とする液晶表示装置。
【請求項９】　請求項１又は２に記載の複合位相差板を、有機ＥＬ表示セルの少なくとも片側に配置したことを特徴とする有機ＥＬ表示装置。
【請求項１０】　請求項３～６のいずれかに記載の円偏光板を、有機ＥＬ表示セルの少なくとも片側に配置したことを特徴とする有機ＥＬ表示装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、延伸された制御透明支持体に、液晶性化合物からなる複屈折層を有する複合位相差板、円偏光板及びそれを用いた液晶表示装置、有機ＥＬ表示装置に関する。特に、反射型液晶表示装置、光利用効率の高い広視野角液晶表示装置、有機ＥＬ（エレクトロルミネッセンス：Electroluminescence）表示装置に用いられる反射防止用のλ／４板として有効な複合位相差板に関するものである。
【０００２】
【従来の技術】ツイストネマチック（ＴＮ）型やスーパーツイストネマチック（ＳＴＮ）型の液晶セルを用いたＴＦＴ（Thin Film Transistor）型等の液晶表示装置が、応答速度性や表示コントラスト性等に着目されて、ワードプロセッサやパーソナルコンピュータをはじめとするＯＡ機器など、種々の装置の表示手段として広く普及している。しかし、見る角度（視角）、特に斜めからの視角でのコントラストの低下が大きいことから、その視角特性を改善するため、従来より液晶セルの片側又は両側に、位相差板（位相差フィルム）を配置している。そして、従来、１枚の延伸フィルムを用いた１／２波長板（λ／２板とも言う）や１／４波長板（λ／４板とも言う）が知られている。
【０００３】しかし、これらの１／２波長板や１／４波長板は、その位相差が波長ごとに異なり、１／２波長板や１／４波長板として機能する波長が、特定のものに限られる問題点があった。すなわち、例えば波長５５０ｎｍの光に対して１／４波長板として機能するものの場合、波長が４５０ｎｍや６５０ｎｍの光に対しては１／４波長板として機能しないため、偏光板に接着して円偏光板とした場合、波長が５５０ｎｍでない青色光に対しては反射防止機能等を発揮しないため、ディスプレイなどが青く見える問題点があった。
【０００４】前記問題を解決するため、広い波長域にわたって１／２波長板や１／４波長板として機能する波長板や、偏光板が開発されてきた。例えば、可視光全般にわたって一定の位相差（例えば、１／４波長）を与える広帯域の位相差板として、１／４波長と１／２波長の位相差を与える複数の延伸フィルムを、光軸を交差させて積層してなる１／４波長板が提案されている（特開平５－１００１１４号公報）。また、透明支持体に配向膜を塗布し、ラビング処理後に液晶性分子を含む光学異方性層を積層する事で、同様の効果を狙った１／４波長板（π／２）も提案されている（特開２００１－４８３７号公報）。
【０００５】
【発明が解決しようとする課題】しかしながら、λ／４板などの製造に当たり、位相差の異なる複数の延伸フィルムを積層する方法では、フィルムの積層によって、位相差板が厚くなるという課題を有している。また、透明支持基板に液晶性化合物を含む光学異方性層を積層する方法では、位相差板が、透明支持基板と液晶層と複屈折フィルム層から形成されるため、積層数が多くなり、製造工程が煩雑になる等の問題がある。さらに性能の良いλ／４板を作成するためには、λ／４板を１層と、λ／２板を２層以上積層する必要があることから、積層数が多くなるほど、特に厚みの点で問題となり、近年の軽量薄型を訴求する液晶表示装置に適さなくなる。
【０００６】また、ＥＬ表示装置では、外光がＥＬ素子の電極に反射して表示のさまたげになり、視認性が低下する問題があった。これを改善するために、偏光板とλ／４板の積層体（円偏光板）を、光取り出し面に取付ける方法も提案されている（特開平８－３２１３８１号公

報）が、厚みが厚くなる問題がある。

【０００７】本発明は、前記従来の問題を解決するため、全可視光域など、広い波長域にわたって１／４波長の位相差を与えることができ、高性能、かつ低コストで容易に製造可能な複合位相差板、円偏光板及びそれを用いた広視野角液晶表示装置、有機ＥＬ表示装置を提供することを目的とする。

【０００８】

【課題を解決するための手段】本発明は、前述の特開平５－１００１１４号公報等において本発明者らが提案した、１／４波長と１／２波長の位相差を有する複数の延伸フィルムを、光軸を交差させて積層してなる広帯域λ／４板の作用機構に鑑み、前記位相差板が有する厚みに関する課題を解決したものであり、位相差フィルムと異なる複屈折を示す複数の液晶層とを組合せる。

【０００９】本発明の複合位相差板は、透明ポリマーフィルムを延伸してなる、実質的に可視光の１／４波長又は１／２波長の位相差値を有する位相差フィルム上に、液晶性化合物からなる、実質的に可視光の１／４波長の位相差値を有する複屈折層と、実質的に可視光の１／２波長の位相差値を有する少なくとも１層の複屈折層とが形成されていることを特徴とする。これにより、容易に広帯域位相差板が得られる。

【００１０】すなわち、λ／４板を得るためには、少なくとも１層のλ／２板とλ／４板を積層する必要があり、さらに高性能のλ／４板を得るためには、λ／４板１層とλ／２板２層を積層することが実用上好ましいが、本発明によれば、基材としてλ／４板またはλ／２板を用い、その基材上に液晶性化合物を含む複屈折層を、λ／４板およびλ／２板として機能するように形成することにより、最小限の構成で薄型の複合位相差板が得られる。

【００１１】前記複合位相差板においては、前記位相差フィルムは、光弾性係数５０×１０$^{-13}$m^2／Ｎ以下のポリマーフィルムを延伸したものであることが好ましい。これにより、外部環境（熱、温度）による位相差値変化が抑えられ、信頼性が向上し、表示の均一性が得られる。

【００１２】次に、本発明の円偏光板は、前記の複合位相差板と偏光板との積層体からなることを特徴とする。これにより、高性能の円偏光板となる。前記積層体においては、前記偏光板が、前記複合位相差板の１／２波長の位相差値を有する位相差フィルム又は複屈折層に積層されていることが好ましい。

【００１３】前記円偏光板においては、複屈折層における波長分散値Δｎ400／Δｎ550（但し、Δｎ400：波長４００ｎｍでの複屈折率、Δｎ550：波長５５０ｎｍでの複屈折率）が、位相差フィルムにおける前記波長分散値よりも大きいことが好ましい。

【００１４】また、前記円偏光板においては、偏光板の透過軸と位相差フィルムの遅相軸が、実質的に平行または直交関係にあることが好ましい。

【００１５】さらに、本発明の液晶表示装置は、前記の複合位相差板又は円偏光板を、液晶セルの少なくとも片側に配置したことを特徴とし、本発明のＥＬ表示装置は、前記の複合位相差板又は円偏光板を、有機ＥＬ表示セルの少なくとも片側に配置したことを特徴とする。本発明の複合位相差板や、又はこれに偏光板を積層して円偏光板としたものを、適宜な角度をなすように、表示セルに接着ないし粘着することにより、ディスプレイ等の表面反射が抑制され、視認性に優れる広視野角のディスプレイを提供できる。

【００１６】

【発明の実施の形態】本発明の複合位相差板は、透明フィルムを延伸してなる、実質的に可視光の１／４波長又は１／２波長の位相差値を有する位相差フィルム上に、液晶性化合物からなる、実質的に可視光の１／４波長の位相差値を有する複屈折層と、同様に液晶性化合物からなる、実質的に可視光の１／２波長の位相差値を有する少なくとも１層の複屈折層が形成されているものである。以下、本発明を詳細に説明する。

【００１７】図１は、本発明の複合位相差板の一例として、基本的な構成を示す模式図である。図１に示すように、透明フィルムを延伸してなる位相差フィルム１（λ／２板）上に、液晶性化合物を含む複屈折層２（λ／２板）が積層され、さらにその上に液晶性化合物を含む複屈折層３（λ／４板）が積層されている。

【００１８】本発明において、位相差フィルム及び複屈折層は、特定波長（λ）において、実質的にλ／２又はλ／４の位相差を有しているものであれば良い。実用上は、可視領域のほぼ中間の波長である５５０ｎｍにおいて、位相差がλ／２又はλ／４であることが好ましい。例えば、特定波長（λ）を５５０ｎｍとした場合、λ／２板として用いるときの位相差フィルム及び複屈折層のレタデーション値（波長５５０ｎｍ）は、２４０～２９０ｎｍであることが好ましく、より好ましくは２５０～２８０ｎｍである。同様に、１／４板として用いるときは、位相差フィルム及び複屈折層のレタデーション値（波長５５０ｎｍ）は、１１０～１４５ｎｍであることが好ましく、１２０～１４０ｎｍであることがより好ましい。なお、液晶セルに本発明の複合位相差板を実装する場合には、液晶の配向による複屈折を考慮して設計する必要があるため、上記のレタデーション値は、λ／２板であっても２００～３００程度、λ／４板であっても８０～２００程度で設計する場合もある。

【００１９】位相差フィルムは、透明ポリマーフィルムを、適宜な方法で延伸することにより形成される。透明ポリマーフィルムは、特に限定されず、フィルム延伸により光学異方性を付与することができる、光透過性のポリマーフィルムを用いることができ、光透過率が７０％

以上、好ましくは８０%以上、特に８５%以上の透光性に優れるフィルムが好ましい。複屈折のムラを少なくするため、ソルベントキャスト法により製造されたものが好ましく用いられる。ポリマーフィルムとしては、一般には、安定した延伸処理により均質な延伸フィルムを得る点などより、３mm以下、好ましくは１μm～１mm、特に好ましくは５～５００μmの厚さのフィルムが用いられる。

【００２０】また、前記ポリマーとしては、特に限定されず、フィルム延伸により光学異方性を付与できるポリマーが好ましく用いられるが、信頼性を考慮すると、ポリマーの光弾性係数が、$５０\times１０^{-13}m^2/N$以下であることが好ましい。ここで、前記ポリマーとしては、例えば、ポリオレフィン（ポリエチレン、ポリプロピレンなど）、ポリノルボルネン系ポリマー、ポリ塩化ビニル、ポリスチレン、ポリアクリロニトリル、ポリスルホン、ポリアリレート、ポリビニルアルコール、ポリメタクリル酸エステル、ポリアクリル酸エステルおよびセルロースエステルや、これらの共重合体等が挙げられる。前記ポリマーは、単独で又は混合物として用いてもよい。

【００２１】ポリマーフィルムの延伸方法は、特に限定されず、一軸延伸、二軸延伸など、公知の延伸方法が用いられる。一軸延伸方法としては、２つ以上のロールの周速差を利用した縦一軸延伸が好ましい。二軸延伸方法としては、一軸延伸に加えて、テンターによる幅方向延伸を付与する方法が好ましく、この際、フィルム長手方向を遅相軸とすることが好ましい。また、遅相軸を長手方向に対して９０°方向とするためには、一軸延伸方法ではテンター延伸により、二軸延伸方法では遅相軸を長手方向に対して９０°方向になるよう延伸軸を制御すればよい。延伸倍率は、延伸方法によって異なるが、通常ポリマーフィルムを１～２００%延伸する。

【００２２】延伸された位相差フィルムの厚さは、使用目的に応じた位相差などにより適宜に決定することができるが、一般には１mm以下、好ましくは１～５００μm、特に好ましくは５～３００μmである。

【００２３】液晶性化合物としては、棒状液晶性化合物が好ましい。液晶性化合物は、実質的に均一に配向していることが好ましく、実質的に均一に配向している状態で固定されていることがさらに好ましく、重合反応により液晶性化合物が固定されていることが最も好ましい。液晶性化合物の配向は、ホモジニアス配向にすることが好ましい。

【００２４】棒状液晶性化合物としては、アゾメチン類、アゾキシ類、シアノビフェニル類、シアノフェニルエステル類、安息香酸エステル類、シクロヘキサンカルボン酸フェニルエステル類、シアノフェニルシクロヘキサン類、シアノ置換フェニルピリミジン類、アルコキシ置換フェニルピリミジン類、フェニルジオキサン類、トラン類およびアルケニルシクロヘキシルベンゾニトリル類が好ましく用いられる。以上のような低分子液晶性化合物だけではなく、高分子液晶性化合物も用いることができる。

【００２５】液晶性化合物を配向させる方法としては、例えば、前記位相差フィルム上に配向膜を形成し、この配向膜の配向処理表面に液晶性化合物の溶液を展開し、熱処理や光処理を施す方法などを用いることができる。配向膜の形成は、ポリマーの薄膜を形成し、その表面をラビング処理する方法や、光配向膜を用い、これを偏光照射する方法などが好ましい。ラビング処理は、ポリマー薄膜表面を、紙や布で一定方向に数回こすることにより実施する。また、前記ポリマー薄膜は、複屈折のムラを少なくするため、ソルベントキャスト法により製造されたものが好ましい。

【００２６】ここで、配向膜形成用ポリマーとしては、前述したものと同様のポリマーが挙げられる。また、配向膜の厚さは、特に限定されないが、一般に、２０～５００nmであることが好ましく、より好ましくは５０～２００nmであり、特に好ましくは５０～１００nmである。また、配向膜上に形成される液晶層の厚さは、配向の乱れや透過率低下の防止の点より、一般に、０．１～１０μmであるが、所望の位相差値によって決定すればよい。

【００２７】なお、前記液晶層の積層数は任意であるが、吸収損失や積層界面における反射損失などによる透過率や視認性の低下を抑制する観点を加味し、さらに光学特性の波長分散を考慮して決定される。光学特性に応じてλ／２板及びλ／４板の積層数を選択する必要がある。

【００２８】位相差フィルムと液晶性化合物からなる複屈折層との積層にあたっては、接着性を向上させるため、位相差フィルムの表面および／または液晶化合物層の表面に、グロー放電処理、コロナ放電処理、紫外線（ＵＶ）処理および火炎処理などの表面処理を施してもよい。また、積層には、粘着剤等の適宜な接着手段を用いることもできる。

【００２９】上記の複合位相差板に偏光板を積層するに際しては、複合位相差板を構成する層のうち、可視光の１／２波長の位相差値を有する層に、偏光板を積層することが好ましい。このような配置をとることにより、広帯域の円偏光板を作製することが可能となる。したがって、例えば、位相差フィルムが可視光の１／４波長の位相差を有する場合は、その上に、液晶性化合物からなる可視光の１／４波長の位相差値を有する複屈折層（λ／４板）を積層し、さらに、液晶性化合物からなる可視光の１／２波長の位相差値を有する複屈折層（λ／２板）を積層して複合位相差板とし、この液晶層（λ／２板）に偏光板を積層する。また、例えば、位相差フィルムが可視光の１／２波長の位相差を有する場合は、液晶性化

合物からなる可視光の１／２波長の位相差値を有する複屈折層（λ／２板）を形成し、さらに、液晶性化合物からなる可視光の１／２波長の位相差値を有する複屈折層（λ／２板）を積層して複合位相差板とし、前記位相差フィルムに偏光板を積層する。したがって、位相差フィルムを、偏光板の片側の保護フィルムとして機能させることもできる。

【００３０】また、偏光板と複合位相差板との積層配置は、任意に設定することができる。

【００３１】偏光板は、偏光フィルムの片側又は両側に、適宜の接着層を介して保護層となる透明保護フィルムを接着したものからなる。偏光フィルムとしては、特に限定はなく、例えばポリビニルアルコール（ＰＶＡ）系フィルムや部分ホルマール化ポリビニルアルコール系フィルム、エチレン・酢酸ビニル共重合体系部分ケン化フィルムの如き親水性高分子フィルムに、ヨウ素及び／又は二色性染料を吸着させて延伸したもの、ポリビニルアルコールの脱水処理物やポリ塩化ビニルの脱塩酸処理物の如きポリエン配向フィルム等からなる偏光フィルムなどがあげられる。中でも、ヨウ素又は二色性染料を吸着配向させたポリビニルアルコール系フィルムが好ましい。偏光フィルムの厚さは、特に限定されるものではないが、１～８０μｍが一般的であり、特に２～４０μｍが好ましい。なお、偏光フィルムの透過軸は、フィルムの延伸方向に垂直な方向に相当する。

【００３２】偏光フィルムの片側又は両側に設ける透明保護層となる保護フィルム素材としては、適宜な透明フィルムを用いることができる。中でも、透明性や機械的強度、熱安定性や水分遮蔽性等に優れるポリマーからなるフィルム等が好ましく用いられる。そのポリマーの例としては、トリアセチルセルロースの如きアセテート系樹脂、ポリエステル系樹脂、ポリエーテルスルホン系樹脂、ポリカーボネート系樹脂、ポリアミド系樹脂、ポリイミド系樹脂、ポリオレフィン系樹脂及びアクリル系樹脂等があげられるが、これに限定されるものではない。保護層は、微粒子の含有によりその表面が微細凹凸構造に形成されていてもよい。

【００３３】偏光特性や耐久性などの点より、特に好ましく用いることができる透明保護フィルムは、表面をアルカリなどでケン化処理したトリアセチルセルロースフィルムである。透明保護フィルムの厚さは、任意であるが一般には偏光板の薄型化などを目的に５００μｍ以下、好ましくは５～３００μｍ、特に好ましくは５～１５０μｍとされる。なお、偏光フィルムの両側に透明保護フィルムを設ける場合、その表裏で異なるポリマー等からなる透明保護フィルムを用いてもよい。また、前述した如く、前記の位相差フィルムを、偏光板の片側の保護フィルムとして用いてもよい。

【００３４】偏光子と保護層である透明保護フィルムとの接着処理は、特に限定されるものではないが、例えば、アクリル系ポリマーやビニルアルコール系ポリマーからなる接着剤、あるいは、ホウ酸やホウ砂、グルタルアルデヒドやメラミン、シュウ酸などのビニルアルコール系ポリマーの水溶性架橋剤から少なくともなる接着剤等を介して行うことができる。これにより、湿度や熱の影響で剥がれにくく、光透過率や偏光度に優れるものとすることができる。かかる接着層は、水溶液の塗布乾燥層等として形成されるものであるが、その水溶液の調製に際しては必要に応じて、他の添加剤や、酸等の触媒も配合することができる。特に、ＰＶＡフィルムとの接着性に優れる点から、ポリビニルアルコールからなる接着剤を用いることが好ましい。

【００３５】偏光板と複合位相差板を積層する方法は、特に限定されるものではなく、透明性の高いものであれば、接着剤、粘着剤等を適宜使用することができる。その他の方法としては、偏光板の保護層として用いられるポリマーフィルム上に配向膜を形成し、その上に１／２波長の位相差を有する複屈折層もしくは１／４波長の位相差を有する複屈折層を順次形成した後、位相差フィルムをその上に接着剤や粘着剤による貼り合わせにて積層することも可能である。その後、ポリマーフィルムを偏光フィルムと接着し、他方にはポリマーフィルムのみを接着すれば良い。

【００３６】また、偏光板と複合位相差板の積層に際しては、接着層などを介して行うことができる。積層に用いられる接着剤（粘着剤）としては、特に限定はなく、例えばアクリル系、シリコーン系、ポリエステル系、ポリウレタン系、ポリエーテル系、ゴム系等の透明な感圧接着剤など、適宜な接着剤を用いることができる。光学フィルム等の光学特性の変化を防止する点より、硬化や乾燥の際に高温のプロセスを要しないものが好ましく、長時間の硬化処理や乾燥時間を要しないものが望ましい。また加熱や加湿条件下に剥離等を生じないものが好ましく用いられる。

【００３７】かかる点より、（メタ）アクリル酸ブチル、（メタ）アクリル酸メチル、（メタ）アクリル酸エチル、（メタ）アクリル酸等のモノマーを重合して得られる、質量平均分子量が１０万以上、ガラス転移温度０℃以下のアクリル系ポリマーからなるアクリル系感圧接着剤が特に好ましく用いられる。また、アクリル系感圧接着剤は、透明性や耐候性や耐熱性などに優れる点からも好ましい。なお、屈折率が異なるものを積層する場合には、反射損の抑制などの点より、中間の屈折率を有する接着剤等が好ましく用いられる。

【００３８】接着剤には、必要に応じて、例えば天然物や合成物の樹脂類、ガラス繊維やガラスビーズ、金属粉やその他の無機粉末等からなる充填剤や、顔料、着色剤や酸化防止剤などの適宜な添加剤を配合することもできる。また微粒子を含有させて光拡散性を示す接着剤層とすることもできる。

【００３９】本発明の複合位相差板および円偏光板は、反射型液晶表示装置や有機ＥＬ表示装置の反射防止用のλ／４板として有効に用いられるが、その実用に際しては、複合位相差板又は円偏光板を、各表示装置の製造過程で順次別個に積層することによっても形成できるが、予め積層することにより、品質の安定性や積層作業性等に優れ、各表示装置の製造効率を向上させうる利点等がある。

【００４０】前述した複合位相差板や偏光板等には、液晶セル等の他部材と接着するための粘着層を設けることもできる。その粘着層は、アクリル系等の従来に準じた適宜な粘着剤にて形成することができる。偏光板や光学フィルムに設けた粘着層が表面に露出する場合には、その粘着層を実用に供するまでの間、汚染防止等を目的にセパレータにて仮着カバーすることが好ましい。セパレータは、上記の透明保護フィルム等に準じた適宜な薄葉体に、必要に応じシリコーン系や長鎖アルキル系、フッ素系や硫化モリブデン等の適宜な剥離剤による剥離コートを設ける方式などにより形成することができる。

【００４１】なお、上記した位相差フィルムや液晶層、偏光子や透明保護層や接着剤層などの各層は、例えばサリチル酸エステル系化合物、ベンゾフェノール系化合物、ベンゾトリアゾール系化合物、シアノアクリレート系化合物、ニッケル錯塩系化合物等の紫外線吸収剤で処理する方式などにより、紫外線吸収能をもたせることもできる。

【００４２】本発明の複合位相差板および円偏光板は、液晶表示装置や有機ＥＬ表示装置等の各種装置の形成に用いることができる。特に、偏光板を液晶セルの片側又は両側に配置してなる反射型や半透過型の液晶表示装置や、有機ＥＬ表示セルを備えた平面ディスプレイ等に好ましく用いることができる。なお、本発明の複合位相差板を液晶セルに実装する場合は、液晶の配向による複屈折を考慮した設計にする必要があり、λ／２板、λ／４板の位相差値や、偏光板との交差角度は、適宜調整する必要がある。

【００４３】具体的には、液晶セルの片側又は両側に偏光板を配置した液晶表示装置や、照明システムにバックライトあるいは反射板を用いたものなど、適宜な液晶表示装置を形成することができる。偏光板を用いた液晶表示装置の場合、位相差フィルムは、液晶セルと偏光板、特に視認側の偏光板との間に配置することが反射防止の点などより好ましい。さらに、液晶表示装置の形成に際しては、例えばプリズムアレイシートやレンズアレイシート、光拡散板やバックライトなどの適宜な部品を適宜な位置に１層又は２層以上配置することができる。

【００４４】

【実施例】以下、実施例及び比較例を用いて本発明を更に具体的に説明する。

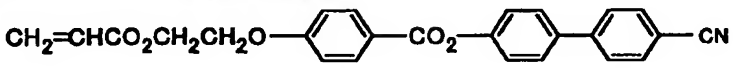
【００４５】（実施例１）第１の層として、厚さ１００μｍ、幅５００ｍｍ、長さ５００ｍの光学的に等方性のロール状ノルボルネンフィルム（光弾性係数：５×１０$^{-13}$ｍ^2／Ｎ）を、１７５℃にて一軸延伸して、位相差フィルムを得た。位相差フィルムの位相差値（△ｎｄ）は２７０ｎｍ（測定波長：５６０ｎｍ）であった。

【００４６】次に、この位相差フィルム上に、第２の層として、１質量％のポリビニルアルコール（日本合成化学製ＮＨ－１８）水溶液を塗布し、９０℃で乾燥し、膜厚約０．０１μｍ以下の皮膜を形成した。その表面を、フィルムの長手方向に対して２７．５°の方向にラビング処理し、配向膜を形成した。その上に、化１の構造の反応性棒状ネマティック液晶と光重合開始剤の混合物を、約３μｍの厚さで製膜し、９０℃で１分間熱処理した後、紫外線架橋を行うことにより、面内位相差２７０ｎｍの位相差値を持つ層を得た。

【００４７】さらに、第３の層として、１質量％のポリビニルアルコール（日本合成化学製ＮＨ－１８）水溶液を塗布し、９０℃で乾燥し、膜厚約０．０１μｍ以下の皮膜を形成した。その表面を、フィルムの長手方向に対して９３．５°の方向にラビング処理し、配向膜を形成した。その上に化１の構造の反応性棒状ネマティック液晶と光重合開始剤の混合物を、約１．５μｍの厚さで製膜し、９０℃で１分熱間処理した後、紫外線架橋を行うことにより、面内位相差１４０ｎｍの位相差値を持つ層を得た。

【００４８】

【化１】



【００４９】得られた複合位相差板の２７０ｎｍ側に、アクリル系感圧接着剤（日東電工製）を用いて、偏光板（日東電工製「ＳＥＧ１４２５ＤＵ」）を貼り合わせ、円偏光板を作製した。この円偏光板の構成を図２に示す。偏光板４の偏光軸とλ／２位相差フィルム１の面内の遅相軸（延伸方向）との角度は６．５°、偏光板４とλ／２液晶コーティング層２の面内の遅相軸（ラビング方向）との角度は３４°、偏光板４とλ／４液晶コーティング層３の面内の遅相軸（ラビング方向）との角度は１００°に設定した。

【００５０】（比較例１）厚さ１００μｍ、幅５００ｍｍ、長さ５００ｍの光学的に等方性のロール状ノルボルネンフィルムを１７５℃にて一軸延伸して、λ／２板とλ／４板の位相差フイルムを得た。位相差フィルムの位相差値（△ｎｄ）は１４０ｎｍと２７０ｎｍ（測定波長：５６０ｎｍ）であった。

【００５１】得られた位相差フィルムに、アクリル系感圧接着剤（実施例１と同様）を用いて、偏光板（日東電

工製ＳＥＧ１４２５ＤＵ）を貼り合わせ、円偏光板を作製した。偏光板の構成は、偏光板の偏光軸と２７０ｎｍ位相差フィルムの面内の遅相軸（延伸方向）との角度は６．５°、偏光板と２７０ｎｍ位相差フィルムの面内の遅相軸（延伸方向）との角度は３４°、偏光板と１４０ｎｍ位相差フィルムの面内の遅相軸（延伸方向）との角度は１００°に設定した。

【００５２】（比較例２）第１の層として、厚さ１００μｍ、幅５００ｍｍ、長さ５００ｍの光学的に等方性のロール状ノルボルネンフィルムを１７５℃にて一軸延伸して、位相差フイルムを得た。位相差フィルムの位相差値（Δｎｄ）は２７０ｎｍ（測定波長：５６０ｎｍ）であった。

【００５３】次に、位相差フィルム上に第２の層として、１質量%のポリビニルアルコール（日本合成化学製ＮＨ－１８）水溶液を塗布し、９０℃で乾燥し、膜厚約０．０１μｍ以下の皮膜を形成した。その表面を、フィルムの長手方向に対して６５°の方向にラビング処理し、配向膜を形成した。その上に、化１の構造の反応性棒状ネマティック液晶と光重合開始剤の混合物を、約１．５μｍの厚さで製膜し、９０℃で１分間熱処理した後、紫外線架橋を行うことにより、面内位相差１４０ｎｍの位相差値を持つ層を得た。

【００５４】得られた複合位相差板の２７０ｎｍ側に、偏光板（日東電工製ＳＥＧ１４２５ＤＵ）を貼り合わせ、円偏光板を得た。偏光板の構成は、偏光板の偏光軸とλ／２位相差フィルムの面内の遅相軸（延伸方向）との角度は１７．５°、偏光板とλ／４液晶コーティング層の面内の遅相軸（ラビング方向）との角度は８０°に設定した。

【００５５】実施例および比較例で得られた円偏光板の特性を、ＫＯＢＲＡ２１－ＡＤＨ（王子計測機器製）で調べた結果を表１に示す。

【００５６】

【表１】

	円偏光板の厚み（μｍ）	円偏光特性
実施例１	３５０	良　好
比較例１	５０５	良　好
比較例２	３３０	不十分

【００５７】表から明らかなように、実施例１では、厚みに関しても薄く設計でき、円偏光板としての性能も良好で、可視光でほぼ完全にλ／４を示すフィルムができた。他方、比較例１では円偏向特性は、実施例１とほぼ同等であるが、厚みの点で厚く問題がある。また、比較例２では、光学特性が不十分であった。

【００５８】また、実施例および比較例で得られた各位相差板について、ＫＯＢＲＡ２１－ＡＤＨ（王子計測機器製）を用いて、４波長（４８１ｎｍ、５５０ｎｍ、６３２ｎｍ、７５４ｎｍ）における複屈折率（Δｎ）を測定し、５５０ｎｍにおける複屈折率（Δｎ５５０）に対する比を求め、プロットした。その結果を図１に示す。図２から明らかなように、従来のλ／４板は、波長５５０ｎｍ近傍の光に対しては１／４波長板として機能するが、その波長域以外では機能していないことがわかる。これに対して、実施例１の複合位相差板は、広い波長域にわたって１／４波長板として機能していることがわかる。

【００５９】

【発明の効果】以上説明したとおり、本発明の積層位相差板は、低コストで容易に製造可能であり、かつ広い波長域にわたって１／２波長板又は１／４波長板として機能する。特に、反射防止用のλ／４板として有効である。また、この複合位相差板と偏光板を積層することにより、可視光領域の光の反射を防止する広帯域の反射防止フィルターとして有用な円偏光板を得ることができる。さらに、これを各種表示装置に実装することにより、視認性に優れた広視野角の液晶表示装置や有機ＥＬ表示装置を実現できる。よって、その工業的価値は大である。

【図面の簡単な説明】

【図１】本発明の複合位相差板の構成例を示す断面図である。

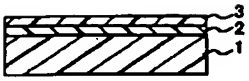
【図２】本発明の円偏光板の構成例を示す図である。

【図３】本発明の複合位相差板の性能（波長分散値）を示す図である。

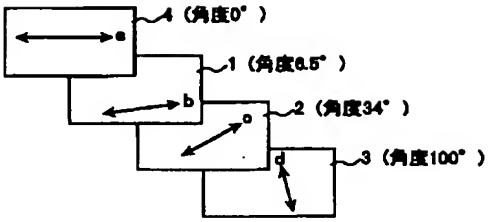
【符号の説明】

１　λ／２板（位相差フィルム）
２　λ／２板（液晶層）
３　λ／４板（液晶層）
４　偏光板
ａ　偏光版の偏光軸
ｂ　λ／２板（位相差フィルム）の面内の遅相軸
ｃ　λ／２板（液晶層）の面内の遅相軸
ｄ　λ／４板（液晶層）の面内の遅相軸

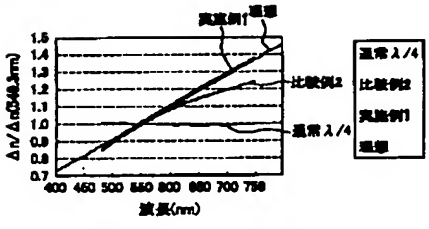
【図１】



【図２】



【図３】



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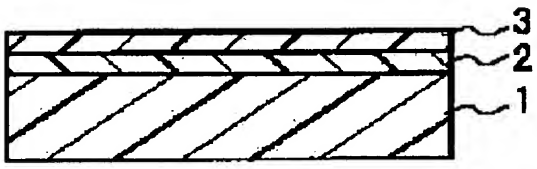
(54) COMPOSITE OPTICAL RETARDATION PLATE, CIRCULARLY POLARIZING PLATE AND LIQUID CRYSTAL DISPLAY, ORGANIC EL DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a composite optical retardation plate with high performance which can be easily manufactured at a low cost and can attain retardation of 1/4 wavelength extending over a wide wavelength region including the total visible ray region, a circularly polarizing plate, a wide viewing angle liquid crystal display and an organic EL(electroluminescence) display device using the composite optical retardation plate.
SOLUTION: The composite optical retardation plate comprises birefringent layers composed of a liquid crystalline compound. One of the layers essentially having retardation value of 1/4 wavelength of the visible rays and at least one layer essentially having retardation value of 1/2 wavelength of the visible rays are formed on an optical retardation film essentially having retardation value of 1/4 or 1/2 wavelength of the visible rays manufactured by stretching a transparent polymer film.



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JAPANESE [JP,2002-372623,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The compound presentation phase differential plate characterized by forming the birefringence layer which consists of a liquid crystallinity compound, and which has the phase contrast value of the quarter-wave length of the light substantially, and at least one-layer birefringence layer which has 1/2 wave of phase contrast value of the light substantially on the phase contrast film which comes to extend a transparence polymer film, and which has the quarter-wave length of the light, or 1/2 wave of phase contrast value substantially.
[Claim 2] The compound presentation phase differential plate according to claim 1 with which said phase contrast film extends the polymer film below photoelastic coefficient 50x10-13m2/N.

[Claim 3] The circular polarization of light plate characterized by consisting of a layered product of a compound presentation phase differential plate and a polarizing plate according to claim 1 or 2.
[Claim 4] The circular polarization of light plate according to claim 3 with which the laminating of said polarizing plate is carried out to the phase contrast film or birefringence layer which has 1/2 wave of phase contrast value of said compound presentation phase differential plate.
[Claim 5] A circular polarization of light plate according to claim 3 or 4 with wavelength dispersion value **n400/**n550 [larger] (however, the rate [in / in **n400 / the wavelength of 400nm] of a birefringence and **n550 are the rates of a birefringence in the wavelength of 550nm) in said birefringence layer than said wavelength dispersion value in said phase contrast film.
[Claim 6] The circular polarization of light plate according to claim 3 to 5 which has substantially the transparency shaft of said polarizing plate, and the lagging axis of said phase contrast film in parallel or orthogonality relation.
[Claim 7] The liquid crystal display characterized for a compound presentation phase differential plate according to claim 1 or 2 by the thing of a liquid crystal cell arranged in one side at least.
[Claim 8] The liquid crystal display characterized for a circular polarization of light plate according to claim 3 to 6 by the thing of a liquid crystal cell arranged in one side at least.
[Claim 9] The organic electroluminescence display characterized for a compound presentation phase differential plate according to claim 1 or 2 by the thing of an organic electroluminescence display cel arranged in one side at least.
[Claim 10] The organic electroluminescence display characterized for a circular polarization of light plate according to claim 3 to 6 by the thing of an organic electroluminescence display cel arranged in one side at least.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the compound presentation phase differential plate which has the birefringence layer which becomes the extended control transparence base material from a liquid crystallinity compound, a circular polarization of light plate and the liquid crystal display using it, and an organic electroluminescence display. It is related with the effective compound presentation phase differential plate as lambda/4 plate for acid resisting especially used for a reflective mold liquid crystal display, a wide-field-of-view angle liquid crystal display with high efficiency for light utilization, and an organic electroluminescence (electroluminescence: Electroluminescence) display.
[0002]
[Description of the Prior Art] Its attention is paid to liquid crystal displays, such as a twist nematic (TN) mold and a TFT (Thin Film Transistor) mold using the liquid crystal cell of a super twist nematic (STN) mold, by speed of response nature, display contrast nature, etc., and they have spread widely as a display means of various equipments, such as OA equipment including a word processor or a personal computer. However, the include angle (viewing angle) to see, since lowering of the contrast in the viewing angle from slant is large, in order to improve the viewing-angle property especially, the phase contrast plate (phase contrast film) is conventionally arranged on one side or the both sides of a liquid crystal cell. And 1/2 wavelength plate (it is also called lambda/2 plate) and quarter-wave length plate (it is also called lambda/4 plate) using the oriented film of one sheet are known conventionally.
[0003] However, the phase contrast differed for every wavelength, and these 1/2 wavelength plates and quarter-wave length plates had the trouble that the wavelength which functions as 1/2 wavelength plate or a quarter-wave length plate was restricted to a specific thing. namely, -- for example, -- wavelength -- 550 -- nm -- light -- receiving -- quarter-wave length -- a plate -- ****** -- functioning -- although -- a case -- wavelength -- 450 -- nm -- 650 -- nm -- light -- receiving -- quarter-wave length -- a plate -- ****** -- not functioning -- a sake -- a polarizing plate -- pasting up -- the circular polarization of light -- a plate -- ** -- having carried out -- a case -- wavelength -- 550 -- nm -- it is not -- blue glow -- receiving -- acid resisting -- a function -- etc. -- not demonstrating -- a sake -- a display -- etc. -- blue -- being visible -- a trouble -- it was .
[0004] In order to solve said problem, the wavelength plate which functions as 1/2 wavelength plate or a quarter-wave length plate over a large wavelength region, and the polarizing plate have been developed. For example, the quarter-wave length plate which an optical axis is made to cross and comes to carry out a laminating is proposed in two or more oriented films which give quarter-wave length and 1/2 wave of phase contrast as a phase contrast plate of the broadband which gives fixed phase contrast (for example, quarter-wave length) over the light at large (JP,5-100114,A). Moreover, the orientation film is applied to a transparence base material,

and the quarter-wave length plate (pi/2) which aimed at the same effectiveness by carrying out the laminating of the optical anisotropy layer which contains a liquid crystallinity molecule after rubbing processing is also proposed (JP,2001-4837,A).

[0005]

[Problem(s) to be Solved by the Invention] However, by the approach of carrying out the laminating of two or more oriented films with which phase contrast differs, it has the technical problem that a phase contrast plate becomes thick, by the laminating of a film in manufacture of lambda/4 plate etc. Moreover, by the approach of carrying out the laminating of the optical anisotropy layer which contains a liquid crystallinity compound in a transparence support substrate, since a phase contrast plate is formed from a transparence support substrate, a liquid crystal layer, and a birefringence film layer, the number of laminatings increases and there are problems, like a production process becomes complicated. It becomes a problem especially in respect of thickness, and stops being suitable for the liquid crystal display which solicits a lightweight thin shape in recent years, so that the number of laminatings increases since it is necessary to carry out the laminating of one layer and the lambda/2 plate for lambda/4 plate more than two-layer in order to create lambda/4 still more powerful plate.

[0006] Moreover, in EL display, outdoor daylight reflected in the electrode of an EL element, it became the hindrance of a display, and there was a problem to which visibility falls. in order to improve this, the method of attaching the layered product (circular polarization of light plate) of a polarizing plate and lambda/4 plate in an optical ejection side is also proposed -- **** (JP,8-321381,A) -- there is a problem to which thickness becomes thick.

[0007] In order that this invention may solve said conventional problem, it can give the phase contrast of quarter-wave length over large wavelength regions, such as all light regions, and aims easy at offering the compound presentation phase differential plate which can be manufactured, a circular polarization of light plate and the wide-field-of-view angle liquid crystal display using it, and an organic electroluminescence display by high performance and low cost.

[0008]

[Means for Solving the Problem] This invention solves the technical problem about the thickness in which said phase contrast plate has two or more oriented films which have quarter-wave length and 1/2 wave of phase contrast which this invention persons proposed in above-mentioned JP,5-100114,A etc. in view of the mechanism of action of broadband lambda / 4 plate which an optical axis is made to cross and comes to carry out a laminating, and combines two or more liquid crystal layers which show a different birefringence from a phase contrast film.

[0009] The compound presentation phase differential plate of this invention on the phase contrast film which comes to extend a transparence polymer film and which has the quarter-wave length of the light, or 1/2 wave of phase contrast value substantially It is characterized by forming the birefringence layer which consists of a liquid crystallinity compound and which has the phase contrast value of the quarter-wave length of the light substantially, and at least one-layer birefringence layer which has 1/2 wave of phase contrast value of the light substantially. Thereby, a broadband phase contrast plate is obtained easily.

[0010] namely, in order to carry out the laminating of lambda/2 plate of at least one layer, and the lambda/4 plate in order to obtain lambda/4 plate, and to obtain lambda/4 plate of high performance further Although it is desirable practically to carry out the laminating of lambda / the 2 plate two-layer to one layer of lambda/4 plates, according to this invention A compound presentation phase differential plate thin with the minimum configuration is obtained by forming the birefringence layer which contains a liquid crystallinity compound on the base material, using lambda/4 plate or lambda/2 plate as a base material, so that it may function as lambda/4 plate and lambda/2 plate.

[0011] As for said phase contrast film, in said compound presentation phase differential plate, it is desirable to extend the polymer film below photoelastic coefficient 50x10-13m2/N. By this,

the phase contrast value change by the external environment (heat, temperature) is suppressed, dependability improves, and the homogeneity of a display is acquired.
[0012] Next, the circular polarization of light plate of this invention is characterized by consisting of a layered product of the aforementioned compound presentation phase differential plate and a polarizing plate. This becomes the circular polarization of light plate of high performance. In said layered product, it is desirable that the laminating of said polarizing plate is carried out to the phase contrast film or birefringence layer which has 1/2 wave of phase contrast value of said compound presentation phase differential plate.
[0013] In said circular polarization of light plate, it is desirable that wavelength dispersion value **n400/**n550 (however, the rate of a birefringence with a **n400:wavelength of 400nm, **n550: rate of a birefringence with a wavelength of 550nm) in a birefringence layer is larger than said wavelength dispersion value in a phase contrast film.
[0014] Moreover, in said circular polarization of light plate, it is desirable that the transparency shaft of a polarizing plate and the lagging axis of a phase contrast film are in parallel or orthogonality relation substantially.
[0015] Furthermore, the liquid crystal display of this invention is characterized for an aforementioned compound presentation phase differential plate or an aforementioned circular polarization of light plate by the thing of a liquid crystal cell arranged in one side at least, and EL display of this invention is characterized for an aforementioned compound presentation phase differential plate or an aforementioned circular polarization of light plate by the thing of an organic electroluminescence display cel arranged in one side at least. the compound presentation phase differential plate of this invention -- or a surface echo of a display etc. is controlled by pasting up thru/or adhering to a display cel so that a proper include angle may be made in what carried out the laminating of the polarizing plate to this, and was used as the circular polarization of light plate, and the display of the wide-field-of-view angle which is excellent in visibility can be offered.
[0016]
[Embodiment of the Invention] The compound presentation phase differential plate of this invention on the phase contrast film which comes to extend a bright film and which has the quarter-wave length of the light, or 1/2 wave of phase contrast value substantially The birefringence layer which consists of a liquid crystallinity compound and which has the phase contrast value of the quarter-wave length of the light substantially, and at least one-layer birefringence layer which consists of a liquid crystallinity compound similarly and which has 1/2 wave of phase contrast value of the light substantially are formed. Hereafter, this invention is explained to a detail.
[0017] Drawing 1 is the mimetic diagram showing a fundamental configuration as an example of the compound presentation phase differential plate of this invention. As shown in drawing 1 , on the phase contrast film 1 (lambda/2 plate) which extends a bright film and becomes, the laminating of the birefringence layer 2 (lambda/2 plate) containing a liquid crystallinity compound is carried out, and the laminating of the birefringence layer 3 (lambda/4 plate) which contains a liquid crystallinity compound on it further is carried out.
[0018] In this invention, the phase contrast film and the birefringence layer should just have the phase contrast of lambda/2 or lambda/4 substantially in specific wavelength (lambda). Practically, in 550nm which is the almost middle wavelength of a visible region, it is desirable that phase contrast is lambda/2 or lambda/4. For example, when specific wavelength (lambda) is set to 550nm, as for the phase contrast film when using as lambda/2 plate, and the RETADESHON value (wavelength of 550nm) of a birefringence layer, it is desirable that it is 240-290nm, and it is 250-280nm more preferably. Similarly, when using as 1/4 plate, as for the RETADESHON value (wavelength of 550nm) of a phase contrast film and a birefringence layer, it is desirable that it is 110-145nm, and it is more desirable that it is 120-140nm. In addition, since it is necessary to design in consideration of the birefringence by the orientation of liquid crystal

to mount the compound presentation phase differential plate of this invention in a liquid crystal cell, even if the above-mentioned RETADESHON value is lambda/2 plate and they are 200 to about 300, and lambda/4 plate, it may be designed about by 80 to 200.

[0019] A phase contrast film is formed by extending a transparence polymer film by the proper approach. Especially a transparence polymer film has the desirable film is not limited, but can use the polymer film of the light transmission nature which can give an optical anisotropy by film drawing, and light transmittance excels [film] in 85% or more of translucency especially preferably 70% or more 80% or more. In order to lessen nonuniformity of a birefringence, what was manufactured by the solvent cast method is used preferably. A film with a thickness of 5-500 micrometers is especially used preferably 1 micrometer - 1mm 3mm or less from the point of generally obtaining a homogeneous oriented film by stable drawing processing as a polymer film etc.

[0020] Moreover, although the polymer which is not limited but can give an optical anisotropy by film drawing especially as said polymer is used preferably, when dependability is taken into consideration, it is desirable that the photoelastic coefficient of a polymer is below 50x10-13m2/N. Here, as said polymer, polyolefines (polyethylene, polypropylene, etc.), a poly norbornene system polymer, a polyvinyl chloride, polystyrene, a polyacrylonitrile, polysulfone, polyarylate, polyvinyl alcohol, polymethacrylic acid ester, polyacrylic ester and cellulose ester, these copolymers, etc. are mentioned, for example. Said polymer is independent or may be used as mixture.

[0021] Especially the drawing approach of a polymer film is not limited, but the well-known drawing approaches, such as uniaxial stretching and biaxial stretching, are used. As the uniaxial-stretching approach, vertical uniaxial stretching using the peripheral-speed difference of two or more rolls is desirable. As the biaxial-stretching approach, the approach of giving the crosswise drawing by the tenter in addition to uniaxial stretching is desirable, and it is desirable in this case to make a film longitudinal direction into a lagging axis. Moreover, what is necessary is just to control a drawing shaft by the biaxial-stretching approach by tenter drawing by the uniaxial-stretching approach to become in the direction of 90 degree to a longitudinal direction about a lagging axis, in order to make a lagging axis into the direction of 90 degree to a longitudinal direction. Although draw magnification changes with drawing approaches, it usually extends a polymer film 1 to 200%.

[0022] Although the phase contrast embraced in activity eye can determine the thickness of the extended phase contrast film suitably, generally it is 5-300 micrometers especially preferably 1-500 micrometers preferably 1mm or less.

[0023] As a liquid crystallinity compound, a cylindrical liquid crystallinity compound is desirable. It is desirable to carry out orientation to homogeneity substantially, as for a liquid crystallinity compound, it is still more desirable to be fixed in the condition of carrying out orientation to homogeneity substantially, and it is most desirable that the liquid crystallinity compound is being fixed by the polymerization reaction. As for the orientation of a liquid crystallinity compound, it is desirable to make it homogeneous orientation.

[0024] As a cylindrical liquid crystallinity compound, azomethines, AZOKISHI, cyano biphenyls, cyanophenyl ester, benzoates, cyclohexane-carboxylic-acid phenyl ester, cyanophenyl cyclohexanes, cyano permutation phenyl pyrimidines, alkoxy permutation phenyl pyrimidines, phenyl dioxanes, tolan, and alkenyl cyclohexyl benzonitriles are used preferably. Not only the above low-molecular-liquid-crystal nature compounds but a polymer liquid crystal nature compound can be used.

[0025] As the approach of carrying out orientation of the liquid crystallinity compound, the orientation film can be formed on said phase contrast film, the solution of a liquid crystallinity compound can be developed on the orientation processing front face of this orientation film, for example, and the approach of performing heat treatment and optical processing etc. can be used. Formation of the orientation film has the approach of forming the thin film of a polymer

and carrying out rubbing processing of the front face, the desirable approach of carrying out the polarization exposure of this using the optical orientation film, etc. Rubbing processing is carried out by rubbing a polymer thin film front face several times in the fixed direction with paper or cloth. Moreover, as for said polymer thin film, what was manufactured by the solvent cast method is desirable in order to lessen nonuniformity of a birefringence.

[0026] Here, the polymer same as a polymer for orientation film formation as what was mentioned above is mentioned. Moreover, although especially the thickness of the orientation film is not limited, generally, it is desirable that it is 20-500nm, it is 50-200nm more preferably, and it is 50-100nm especially preferably. Moreover, what is necessary is for a desired phase contrast value just to determine it more generally than turbulence of orientation, and the point of prevention of permeability lowering, although the thickness of the liquid crystal layer formed on the orientation film is 0.1-10 micrometers.

[0027] In addition, although the number of laminatings of said liquid crystal layer is arbitrary, the viewpoint which controls lowering of the permeability by absorption loss, the reflection loss in a laminating interface, etc. or visibility is considered, and it is further determined in consideration of the wavelength dispersion of an optical property. It is necessary to choose the number of laminatings of lambda/2 plate and lambda/4 plate according to an optical property.

[0028] In order to raise an adhesive property in a laminating with the birefringence layer which consists of a phase contrast film and a liquid crystallinity compound, surface treatment, such as glow discharge processing, corona discharge treatment, ultraviolet-rays (UV) processing, and flame treatment, may be performed to the front face of a phase contrast film, and/or the front face of a liquid crystal compound layer. Moreover, proper adhesion means, such as a binder, can also be used for a laminating.

[0029] It is desirable to face to carry out the laminating of the polarizing plate to the above-mentioned compound presentation phase differential plate, and to carry out the laminating of the polarizing plate to the layer which has 1/2 wave of phase contrast value of the light among the layers which constitute a compound presentation phase differential plate. By taking such arrangement, it becomes possible to produce the circular polarization of light plate of a broadband. Therefore, when a phase contrast film has the phase contrast of the quarter-wave length of the light, [for example,] The laminating of the birefringence layer (lambda/4 plate) which has the phase contrast value of the quarter-wave length of the light which moreover consists of a liquid crystallinity compound is carried out. Furthermore, the laminating of the birefringence layer (lambda/2 plate) which has 1/2 wave of phase contrast value of the light which consists of liquid crystallinity compounds is carried out, it considers as a compound presentation phase differential plate, and the laminating of the polarizing plate is carried out to this liquid crystal layer (lambda/2 plate). Moreover, when a phase contrast film has 1/2 wave of phase contrast of the light, [for example,] The birefringence layer (lambda/2 plate) which has 1/2 wave of phase contrast value of the light which consists of liquid crystallinity compounds is formed, and the laminating of the birefringence layer (lambda/2 plate) which has further 1/2 wave of phase contrast value of the light which consists of liquid crystallinity compounds is carried out, it considers as a compound presentation phase differential plate, and the laminating of the polarizing plate is carried out to said phase contrast film. Therefore, a phase contrast film can also be operated as a protection film of one side of a polarizing plate.

[0030] Moreover, laminating arrangement with a polarizing plate and a compound presentation phase differential plate can be set as arbitration.

[0031] A polarizing plate consists of what pasted up the transparence protection film which serves as a protective layer through a proper glue line at one side or the both sides of a polarization film. As a polarization film, the polarization film which especially definition does not have, for example, consists of a polyene oriented film like the thing and the dehydration processing object of polyvinyl alcohol which the hydrophilic high polymer film like a polyvinyl

alcohol (PVA) system film, a partial formal-ized polyvinyl alcohol system film, and an ethylene-vinylacetate copolymer system partial saponification film was made to adsorb, and extended iodine and/or dichromatic dye to it, or the demineralization acid-treatment object of a polyvinyl chloride etc. is raised. Especially, the polyvinyl alcohol system film to which adsorption orientation of iodine or the dichromatic dye was carried out is desirable. Although especially the thickness of a polarization film is not limited, its 1-80 micrometers are common, and its 2-40 micrometers are especially desirable. In addition, the transparency shaft of a polarization film corresponds in the direction vertical to the drawing direction of a film.

[0032] A proper bright film can be used as a protection film raw material used as the transparent protection layer prepared in one side or the both sides of a polarization film. The film which consists of a polymer which is excellent in transparency, a mechanical strength and thermal stability, moisture electric shielding nature, etc. especially is used preferably. As an example of the polymer, although the acetate system resin like triacetyl cellulose, polyester system resin, polyether sulphone system resin, polycarbonate system resin, polyamide system resin, polyimide system resin, polyolefine system resin, acrylic resin, etc. are raised, it is not limited to this. As for the protective layer, the front face may be formed in detailed irregularity structure of content of a particle.

[0033] The transparence protection film which can be used especially more preferably than points, such as a polarization property and endurance, is a triacetyl cellulose film which carried out saponification processing of the front face with alkali etc. Although the thickness of a transparence protection film is arbitrary, generally it is especially set to 5-150 micrometers preferably 5-300 micrometers 500 micrometers or less for the purpose of thin-shape-izing of a polarizing plate etc. In addition, when preparing a transparence protection film in the both sides of a polarization film, the transparence protection film which consists of a polymer which is different on the front reverse side may be used. Moreover, as mentioned above, the aforementioned phase contrast film may be used as a protection film of one side of a polarizing plate.

[0034] Especially adhesion processing with a polarizer and the transparence protection film which is a protective layer can be performed through the adhesives which consist of a water-soluble cross linking agent of vinyl alcohol system polymers, such as adhesives which consist of an acrylic polymer or a vinyl alcohol system polymer or a boric acid and a borax, glutaraldehyde, and a melamine, oxalic acid, at least, for example, although not limited. Thereby, it shall be hard to separate under the effect of humidity or heat, and shall excel in light transmittance or degree of polarization. Although this glue line is formed as a spreading desiccation layer of a water solution etc., it can also blend other additives and the catalyst of an acid etc. if needed on the occasion of preparation of the water solution. It is desirable to use the adhesives which consist of polyvinyl alcohol from the point of excelling in an adhesive property with a PVA film especially.

[0035] Especially the approach of carrying out the laminating of a polarizing plate and the compound presentation phase differential plate is not limited, and if transparency is high, adhesives, a binder, etc. can be suitably used for it. After carrying out sequential formation of the birefringence layer which has the phase contrast of the birefringence layer which forms the orientation film as the other approaches on the polymer film used as a protective layer of a polarizing plate, and has 1/2 wave of phase contrast on it, or quarter-wave length, it is also possible to carry out the laminating of the phase contrast film in the lamination by adhesives or the binder on it. Then, what is necessary is to paste up a polymer film with a polarization film and to paste up only a polymer film on another side.

[0036] Moreover, on the occasion of the laminating of a polarizing plate and a compound presentation phase differential plate, it can carry out through a glue line etc. As adhesives (binder) used for a laminating, there is especially no definition, for example, it can use proper adhesives, such as transparent pressure sensitive adhesives, such as acrylic, a silicone system,

a polyester system, a polyurethane system, a polyether system, and a rubber system. What does not require a hot process in the case of hardening or desiccation is desirable, and what does not require hardening processing or the drying time of long duration is more desirable than the point of preventing change of optical properties, such as an optical film. Moreover, what does not produce exfoliation etc. is preferably used for the bottom of heating or a humidification condition.

[0037] The acrylic pressure sensitive adhesive which is obtained from this point by carrying out the polymerization of the monomers, such as butyl acrylate (meta), a methyl acrylate (meta), an ethyl acrylate (meta), and an acrylic acid (meta), and with which mass average molecular weight consists of an acrylic polymer 100,000 or more and not more than glass-transition-temperature 0 degree C is used especially preferably. Moreover, an acrylic pressure sensitive adhesive is desirable also from the point of excelling in transparency, weatherability, thermal resistance, etc. In addition, when carrying out the laminating of that from which a refractive index differs, the adhesives which have the refractive index of an inside question are preferably used from points, such as control of reflection loss.

[0038] Proper additives, such as a bulking agent which consists of the resin of a natural product or a compost, a glass fiber, a glass bead and a metal powder, other inorganic powder, etc., a pigment and a coloring agent, and an antioxidant, can also be blended with adhesives if needed. Moreover, it can also consider as the adhesives layer which is made to contain a particle and shows optical diffusibility.

[0039] Although the compound presentation phase differential plate and circular polarization of light plate of this invention are effectively used as lambda/4 plate for acid resisting of a reflective mold liquid crystal display or an organic electroluminescence display Although it can form on the occasion of the practical use also by carrying out the laminating of a compound presentation phase differential plate or the circular polarization of light plate separately one by one in the manufacture process of each display, by carrying out a laminating beforehand, it excels in stability, laminating workability, etc. of quality, and there is an advantage in which the manufacture effectiveness of each display is raised and it deals.

[0040] The adhesive layer for pasting the compound presentation phase differential plate and polarizing plate which were mentioned above with other members, such as a liquid crystal cell, can also be prepared. The adhesive layer can be formed with the proper binder according to the former, such as acrylic. It is desirable to carry out tentative installation covering with a separator for the purpose of a pollution control etc. until it presents practical use with the adhesive layer, when the adhesive layer prepared in the polarizing plate or the optical film is exposed to a front face. A separator can be formed with the method which establishes the exfoliation coat by proper removers, such as a silicone system, a long-chain alkyl system, a fluorine system, and a molybdenum sulfide, in the proper Japanese tissue object according to the above-mentioned transparence protection film etc. if needed.

[0041] In addition, above-mentioned each class, such as a phase contrast film, a liquid crystal layer, a polarizer and transparent protection layer, and an adhesives layer, can also give ultraviolet absorption ability with the method processed with ultraviolet ray absorbents, such as for example, a salicylate system compound, a benzo phenol system compound, a benzotriazol system compound, a cyanoacrylate system compound, and a nickel complex salt system compound.

[0042] The compound presentation phase differential plate and circular polarization of light plate of this invention can be used for formation of various equipments, such as a liquid crystal display and an organic electroluminescence display. It can use for the reflective mold and the transflective type liquid crystal display which come to arrange a polarizing plate on one side or the both sides of a liquid crystal cell especially, the flat-surface display equipped with the organic electroluminescence display cel, etc. preferably. In addition, to mount the compound presentation phase differential plate of this invention in a liquid crystal cell, it is necessary to

make it the design in consideration of the birefringence by the orientation of liquid crystal, and to adjust suitably whenever [with a polarizing plate / phase contrast value / of lambda/2 plate and lambda/4 plate / and crossed-axes-angle].

[0043] Specifically, proper liquid crystal displays, such as a liquid crystal display which has arranged the polarizing plate on one side or the both sides of a liquid crystal cell, and a thing which used the back light or the reflecting plate for the lighting system, can be formed. As for a phase contrast film, in the case of the liquid crystal display using a polarizing plate, it is more desirable than the point of acid resisting etc. to arrange between a liquid crystal cell, a polarizing plate, especially the polarizing plate by the side of a check by looking. Furthermore, on the occasion of formation of a liquid crystal display, proper components, such as a prism array sheet, a lens array sheet, an optical diffusion plate, and a back light, can be arranged one layer or more than two-layer in a proper location, for example.

[0044]

[Example] Hereafter, this invention is explained still more concretely using an example and the example of a comparison.

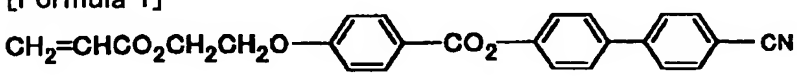
[0045] (Example 1) as the 1st layer -- 100 micrometers in thickness, width of face of 500mm, and die length of 500m -- optically, uniaxial stretching of the isotropic roll-like norbornene film (photoelastic coefficient: 5x10-13m2/N) was carried out at 175 degrees C, and the phase contrast film was obtained. The phase contrast value (**nd) of a phase contrast film was 270nm (measurement wavelength: 560nm).

[0046] Next, on this phase contrast film, as the 2nd layer, the polyvinyl alcohol (NHmade from Japanese synthetic chemistry- 18) water solution of 1 mass % was applied, it dried at 90 degrees C, and the coat of about 0.01 micrometers or less of thickness was formed. Rubbing processing of the front face was carried out in the 27.5-degree direction to the longitudinal direction of a film, and the orientation film was formed. After producing the reactant cylindrical pneumatic liquid crystal of the structure of ** 1, and the mixture of a photopolymerization initiator by the thickness of about 3 micrometers moreover and heat-treating for 1 minute at 90 degrees C, the layer with the phase contrast value of 270nm of phase contrast within a field was obtained by performing ultraviolet-rays bridge formation.

[0047] Furthermore, as the 3rd layer, the polyvinyl alcohol (NHmade from Japanese synthetic chemistry- 18) water solution of 1 mass % was applied, it dried at 90 degrees C, and the coat of about 0.01 micrometers or less of thickness was formed. Rubbing processing of the front face was carried out in the 93.5-degree direction to the longitudinal direction of a film, and the orientation film was formed. After producing the reactant cylindrical pneumatic liquid crystal of the structure of ** 1, and the mixture of a photopolymerization initiator by the thickness of about 1.5 micrometers on it and processing between 1-minute heat at 90 degrees C, the layer with the phase contrast value of 140nm of phase contrast within a field was obtained by performing ultraviolet-rays bridge formation.

[0048]

[Formula 1]



[0049] The acrylic pressure sensitive adhesive (NITTO DENKO make) was used for the 270nm side of the obtained compound presentation phase differential plate, and lamination and a circular polarization of light plate were produced for the polarizing plate ("SEG1425DU" by NITTO DENKO). The configuration of this circular polarization of light plate is shown in drawing 2 . In the include angle of the polarization shaft of a polarizing plate 4, and the lagging axis within the field of lambda / 2 phase-contrast film 1 (the drawing direction), the include angle of 6.5 degrees, a polarizing plate 4, and the lagging axis within the field of lambda / 2 liquid-crystal coating layer 2 (the direction of rubbing) set the include angle of 34 degrees, a polarizing plate 4,

and the lagging axis within the field of lambda / 4 liquid-crystal coating layer 3 (the direction of rubbing) as 100 degrees.
[0050] (Example 1 of a comparison) 100 micrometers in thickness, width of face of 500mm, and die length of 500m -- uniaxial stretching of the isotropic roll-like norbornene film was optically carried out at 175 degrees C, and the phase contrast film of lambda/2 plate and lambda/4 plate was obtained. The phase contrast values (**nd) of a phase contrast film were 140nm and 270nm (measurement wavelength: 560nm).
[0051] the acrylic pressure sensitive adhesive (an example 1 -- the same) was used for the obtained phase contrast film, and lamination and a circular polarization of light plate were produced for the polarizing plate (NITTO DENKO SEG1425DU). The include angle of the polarization shaft whose configuration of a polarizing plate is a polarizing plate, and the lagging axis within the field of 270nm phase contrast film (the drawing direction) set about 140nm of 6.5 degrees, a polarizing plate, and about 270nm of include angles with the lagging axis within the field of a phase reference film (the drawing direction) as 100 degrees for the include angle with the lagging axis within the field of a phase reference film (the drawing direction) with 34 degrees and a polarizing plate.
[0052] (Example 2 of a comparison) as the 1st layer -- 100 micrometers in thickness, width of face of 500mm, and die length of 500m -- uniaxial stretching of the isotropic roll-like norbornene film was optically carried out at 175 degrees C, and the phase contrast film was obtained. The phase contrast value (**nd) of a phase contrast film was 270nm (measurement wavelength: 560nm).
[0053] Next, on the phase contrast film, as the 2nd layer, the polyvinyl alcohol (NHmade from Japanese synthetic chemistry- 18) water solution of 1 mass % was applied, it dried at 90 degrees C, and the coat of about 0.01 micrometers or less of thickness was formed. Rubbing processing of the front face was carried out in the 65-degree direction to the longitudinal direction of a film, and the orientation film was formed. After producing the reactant cylindrical pneumatic liquid crystal of the structure of ** 1, and the mixture of a photopolymerization initiator by the thickness of about 1.5 micrometers moreover and heat-treating for 1 minute at 90 degrees C, the layer with the phase contrast value of 140nm of phase contrast within a field was obtained by performing ultraviolet-rays bridge formation.
[0054] To the 270nm side of the obtained compound presentation phase differential plate, lamination and a circular polarization of light plate were obtained for the polarizing plate (NITTO DENKO SEG1425DU). In the configuration of a polarizing plate, the include angle of the polarization shaft of a polarizing plate and the lagging axis within the field of lambda / 2 phase-contrast film (the drawing direction) set the include angle of 17.5 degrees, a polarizing plate, and the lagging axis within the field of lambda / 4 liquid-crystal coating layer (the direction of rubbing) as 80 degrees.
[0055] The result of having investigated the property of the circular polarization of light plate obtained in the example and the example of a comparison by KOBRA21-ADH (product made from the Oji measuring machine machine) is shown in a table 1.
[0056]
[A table 1]
Thickness of a circular polarization of light plate (micrometer) Circular polarization of light property example 1 350 Good Example 1 of a good comparison 505 Good Example 2 of a good comparison 330 Imperfection [0057] In the example 1, it could design thinly also about thickness, and the engine performance as a circular polarization of light plate was also good, and the film in which lambda/4 is shown nearly thoroughly by the light was made so that clearly from a table. On the other hand, in the example 1 of a comparison, although the circle deflection property is almost equivalent to an example 1, there is a problem thickly in respect of thickness. Moreover, the example 2 of a comparison of the optical property was inadequate.
[0058] Moreover, about the Gentlemen phase differential plate obtained in the example and the

example of a comparison, using KOBRA21-ADH (product made from the Oji measuring machine machine), the rate of a birefringence (deltan) in four waves (481nm, 550nm, 632nm, 754nm) was measured, and the ratio to the rate of a birefringence in 550nm (deltan550) was asked for and plotted. The result is shown in drawing 1 . Although lambda/4 conventional plate functions as a quarter-wave length plate to light with a wavelength of about 550nm, except the wavelength region, it turns out that it is not functioning, so that clearly from drawing 2 . On the other hand, it turns out that the compound presentation phase differential plate of an example 1 is functioning as a quarter-wave length plate over a large wavelength region.

[0059]

[Effect of the Invention] The laminating phase contrast plate of this invention functions [by low cost / easily] over a large wavelength region as 1/2 wavelength plate or a quarter-wave length plate that it can manufacture as explained above. Especially, it is effective as lambda/4 plate for acid resisting. Moreover, a circular polarization of light plate useful as an acid-resisting filter of a broadband which prevents the echo of the light of a light field can be obtained by carrying out the laminating of this compound presentation phase differential plate and polarizing plate. Furthermore, the liquid crystal display and organic electroluminescence display of a wide-field-of-view angle excellent in visibility are realizable by mounting this in various displays. Therefore, the industrial value is size.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to the compound presentation phase differential plate which has the birefringence layer which becomes the extended control transparence base material from a liquid crystallinity compound, a circular polarization of light plate and the liquid crystal display using it, and an organic electroluminescence display. It is related with the effective compound presentation phase differential plate as lambda/4 plate for acid resisting especially used for a reflective mold liquid crystal display, a wide-field-of-view angle liquid crystal display with high efficiency for light utilization, and an organic electroluminescence (electroluminescence: Electroluminescence) display.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Its attention is paid to liquid crystal displays, such as a twist nematic (TN) mold and a TFT (Thin Film Transistor) mold using the liquid crystal cell of a super twist nematic (STN) mold, by speed of response nature, display contrast nature, etc., and they have spread widely as a display means of various equipments, such as OA equipment including a word processor or a personal computer. However, the include angle (viewing angle) to see, since lowering of the contrast in the viewing angle from slant is large, in order to improve the viewing-angle property especially, the phase contrast plate (phase contrast film) is conventionally arranged on one side or the both sides of a liquid crystal cell. And 1/2 wavelength plate (it is also called lambda/2 plate) and quarter-wave length plate (it is also called lambda/4 plate) using the oriented film of one sheet are known conventionally.
[0003] However, the phase contrast differed for every wavelength, and these 1/2 wavelength plates and quarter-wave length plates had the trouble that the wavelength which functions as 1/2 wavelength plate or a quarter-wave length plate was restricted to a specific thing. namely, -- for example, -- wavelength -- 550 -- nm -- light -- receiving -- quarter-wave length -- a plate -- ****** -- functioning -- although -- a case -- wavelength -- 450 -- nm -- 650 -- nm -- light -- receiving -- quarter-wave length -- a plate -- ****** -- not functioning -- a sake -- a polarizing plate -- pasting up -- the circular polarization of light -- a plate -- ** -- having carried out -- a case -- wavelength -- 550 -- nm -- it is not -- blue glow -- receiving -- acid resisting -- a function -- etc. -- not demonstrating -- a sake -- a display -- etc. -- blue -- being visible -- a trouble -- it was .
[0004] In order to solve said problem, the wavelength plate which functions as 1/2 wavelength plate or a quarter-wave length plate over a large wavelength region, and the polarizing plate have been developed. For example, the quarter-wave length plate which an optical axis is made to cross and comes to carry out a laminating is proposed in two or more oriented films which give quarter-wave length and 1/2 wave of phase contrast as a phase contrast plate of the broadband which gives fixed phase contrast (for example, quarter-wave length) over the light at large (JP,5-100114,A). Moreover, the orientation film is applied to a transparence base material, and the quarter-wave length plate (pi/2) which aimed at the same effectiveness by carrying out the laminating of the optical anisotropy layer which contains a liquid crystallinity molecule after rubbing processing is also proposed (JP,2001-4837,A).

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] The laminating phase contrast plate of this invention functions [by low cost / easily] over a large wavelength region as 1/2 wavelength plate or a quarter-wave length plate that it can manufacture as explained above. Especially, it is effective as lambda/4 plate for acid resisting. Moreover, a circular polarization of light plate useful as an acid-resisting filter of a broadband which prevents the echo of the light of a light field can be obtained by carrying out the laminating of this compound presentation phase differential plate and polarizing plate. Furthermore, the liquid crystal display and organic electroluminescence display of a wide-field-of-view angle excellent in visibility are realizable by mounting this in various displays. Therefore, the industrial value is size.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, by the approach of carrying out the laminating of two or more oriented films with which phase contrast differs, it has the technical problem that a phase contrast plate becomes thick, by the laminating of a film in manufacture of lambda/4 plate etc. Moreover, by the approach of carrying out the laminating of the optical anisotropy layer which contains a liquid crystallinity compound in a transparence support substrate, since a phase contrast plate is formed from a transparence support substrate, a liquid crystal layer, and a birefringence film layer, the number of laminatings increases and there are problems, like a production process becomes complicated. It becomes a problem especially in respect of thickness, and stops being suitable for the liquid crystal display which solicits a lightweight thin shape in recent years, so that the number of laminatings increases since it is necessary to carry out the laminating of one layer and the lambda/2 plate for lambda/4 plate more than two-layer in order to create lambda/4 still more powerful plate.
[0006] Moreover, in EL display, outdoor daylight reflected in the electrode of an EL element, it became the hindrance of a display, and there was a problem to which visibility falls. in order to improve this, the method of attaching the layered product (circular polarization of light plate) of a polarizing plate and lambda/4 plate in an optical ejection side is also proposed -- **** (JP,8-321381,A) -- there is a problem to which thickness becomes thick.
[0007] In order that this invention may solve said conventional problem, it can give the phase contrast of quarter-wave length over large wavelength regions, such as all light regions, and aims easy at offering the compound presentation phase differential plate which can be manufactured, a circular polarization of light plate and the wide-field-of-view angle liquid crystal display using it, and an organic electroluminescence display by high performance and low cost.

[Translation done.]

TECHNICAL PROBLEM

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[0006] Moreover, in EL display, outdoor daylight reflected in the electrode of an EL element, it became the hindrance of a display, and there was a problem to which visibility falls. in order to improve this, the method of attaching the layered product (circular polarization of light plate) of a polarizing plate and lambda/4 plate in an optical ejection side is also proposed -- **** (JP,8-321381,A) -- there is a problem to which thickness becomes thick.
[0007] In order that this invention may solve said conventional problem, it can give the phase contrast of quarter-wave length over large wavelength regions, such as all light regions, and aims easy at offering the compound presentation phase differential plate which can be manufactured, a circular polarization of light plate and the wide-field-of-view angle liquid crystal display using it, and an organic electroluminescence display by high performance and low cost.

[Translation done.]

MEANS

[Means for Solving the Problem] This invention solves the technical problem about the thickness in which said phase contrast plate has two or more oriented films which have quarter-wave length and 1/2 wave of phase contrast which this invention persons proposed in above-mentioned JP,5-100114,A etc. in view of the mechanism of action of broadband lambda / 4 plate which an optical axis is made to cross and comes to carry out a laminating, and combines two or more liquid crystal layers which show a different birefringence from a phase contrast film.
[0009] The compound presentation phase differential plate of this invention on the phase contrast film which comes to extend a transparence polymer film and which has the quarter-wave length of the light, or 1/2 wave of phase contrast value substantially It is characterized by forming the birefringence layer which consists of a liquid crystallinity compound and which has the phase contrast value of the quarter-wave length of the light substantially, and at least one-layer birefringence layer which has 1/2 wave of phase contrast value of the light substantially. Thereby, a broadband phase contrast plate is obtained easily.
[0010] namely, in order to carry out the laminating of lambda/2 plate of at least one layer, and the lambda/4 plate in order to obtain lambda/4 plate, and to obtain lambda/4 plate of high performance further Although it is desirable practically to carry out the laminating of lambda / the 2 plate two-layer to one layer of lambda/4 plates, according to this invention A compound presentation phase differential plate thin with the minimum configuration is obtained by forming the birefringence layer which contains a liquid crystallinity compound on the base material, using lambda/4 plate or lambda/2 plate as a base material, so that it may function as lambda/4 plate and lambda/2 plate.
[0011] As for said phase contrast film, in said compound presentation phase differential plate, it is desirable to extend the polymer film below photoelastic coefficient 50x10-13m2/N. By this, the phase contrast value change by the external environment (heat, temperature) is suppressed, dependability improves, and the homogeneity of a display is acquired.
[0012] Next, the circular polarization of light plate of this invention is characterized by consisting of a layered product of the aforementioned compound presentation phase differential plate and a polarizing plate. This becomes the circular polarization of light plate of high performance. In said layered product, it is desirable that the laminating of said polarizing plate is carried out to the phase contrast film or birefringence layer which has 1/2 wave of phase contrast value of said compound presentation phase differential plate.
[0013] In said circular polarization of light plate, it is desirable that wavelength dispersion value **n400/**n550 (however, the rate of a birefringence with a **n400:wavelength of 400nm, **n550: rate of a birefringence with a wavelength of 550nm) in a birefringence layer is larger than said wavelength dispersion value in a phase contrast film.
[0014] Moreover, in said circular polarization of light plate, it is desirable that the transparency shaft of a polarizing plate and the lagging axis of a phase contrast film are in parallel or

orthogonality relation substantially.
[0015] Furthermore, the liquid crystal display of this invention is characterized for an aforementioned compound presentation phase differential plate or an aforementioned circular polarization of light plate by the thing of a liquid crystal cell arranged in one side at least, and EL display of this invention is characterized for an aforementioned compound presentation phase differential plate or an aforementioned circular polarization of light plate by the thing of an organic electroluminescence display cel arranged in one side at least. the compound presentation phase differential plate of this invention -- or a surface echo of a display etc. is controlled by pasting up thru/or adhering to a display cel so that a proper include angle may be made in what carried out the laminating of the polarizing plate to this, and was used as the circular polarization of light plate, and the display of the wide-field-of-view angle which is excellent in visibility can be offered.
[0016]
[Embodiment of the Invention] The compound presentation phase differential plate of this invention on the phase contrast film which comes to extend a bright film and which has the quarter-wave length of the light, or 1/2 wave of phase contrast value substantially The birefringence layer which consists of a liquid crystallinity compound and which has the phase contrast value of the quarter-wave length of the light substantially, and at least one-layer birefringence layer which consists of a liquid crystallinity compound similarly and which has 1/2 wave of phase contrast value of the light substantially are formed. Hereafter, this invention is explained to a detail.
[0017] Drawing 1 is the mimetic diagram showing a fundamental configuration as an example of the compound presentation phase differential plate of this invention. As shown in drawing 1 , on the phase contrast film 1 (lambda/2 plate) which extends a bright film and becomes, the laminating of the birefringence layer 2 (lambda/2 plate) containing a liquid crystallinity compound is carried out, and the laminating of the birefringence layer 3 (lambda/4 plate) which contains a liquid crystallinity compound on it further is carried out.
[0018] In this invention, the phase contrast film and the birefringence layer should just have the phase contrast of lambda/2 or lambda/4 substantially in specific wavelength (lambda). Practically, in 550nm which is the almost middle wavelength of a visible region, it is desirable that phase contrast is lambda/2 or lambda/4. For example, when specific wavelength (lambda) is set to 550nm, as for the phase contrast film when using as lambda/2 plate, and the RETADESHON value (wavelength of 550nm) of a birefringence layer, it is desirable that it is 240-290nm, and it is 250-280nm more preferably. Similarly, when using as 1/4 plate, as for the RETADESHON value (wavelength of 550nm) of a phase contrast film and a birefringence layer, it is desirable that it is 110-145nm, and it is more desirable that it is 120-140nm. In addition, since it is necessary to design in consideration of the birefringence by the orientation of liquid crystal to mount the compound presentation phase differential plate of this invention in a liquid crystal cell, even if the above-mentioned RETADESHON value is lambda/2 plate and they are 200 to about 300, and lambda/4 plate, it may be designed about by 80 to 200.
[0019] A phase contrast film is formed by extending a transparence polymer film by the proper approach. Especially a transparence polymer film has the desirable film is not limited, but can use the polymer film of the light transmission nature which can give an optical anisotropy by film drawing, and light transmittance excels [film] in 85% or more of translucency especially preferably 70% or more 80% or more. In order to lessen nonuniformity of a birefringence, what was manufactured by the solvent cast method is used preferably. A film with a thickness of 5-500 micrometers is especially used preferably 1 micrometer - 1mm 3mm or less from the point of generally obtaining a homogeneous oriented film by stable drawing processing as a polymer film etc.
[0020] Moreover, although the polymer which is not limited but can give an optical anisotropy by film drawing especially as said polymer is used preferably, when dependability is taken into

consideration, it is desirable that the photoelastic coefficient of a polymer is below 50x10-13m2/N. Here, as said polymer, polyolefines (polyethylene, polypropylene, etc.), a poly norbornene system polymer, a polyvinyl chloride, polystyrene, a polyacrylonitrile, polysulfone, polyarylate, polyvinyl alcohol, polymethacrylic acid ester, polyacrylic ester and cellulose ester, these copolymers, etc. are mentioned, for example. Said polymer is independent or may be used as mixture.

[0021] Especially the drawing approach of a polymer film is not limited, but the well-known drawing approaches, such as uniaxial stretching and biaxial stretching, are used. As the uniaxial-stretching approach, vertical uniaxial stretching using the peripheral-speed difference of two or more rolls is desirable. As the biaxial-stretching approach, the approach of giving the crosswise drawing by the tenter in addition to uniaxial stretching is desirable, and it is desirable in this case to make a film longitudinal direction into a lagging axis. Moreover, what is necessary is just to control a drawing shaft by the biaxial-stretching approach by tenter drawing by the uniaxial-stretching approach to become in the direction of 90 degree to a longitudinal direction about a lagging axis, in order to make a lagging axis into the direction of 90 degree to a longitudinal direction. Although draw magnification changes with drawing approaches, it usually extends a polymer film 1 to 200%.

[0022] Although the phase contrast embraced in activity eye can determine the thickness of the extended phase contrast film suitably, generally it is 5-300 micrometers especially preferably 1-500 micrometers preferably 1mm or less.

[0023] As a liquid crystallinity compound, a cylindrical liquid crystallinity compound is desirable. It is desirable to carry out orientation to homogeneity substantially, as for a liquid crystallinity compound, it is still more desirable to be fixed in the condition of carrying out orientation to homogeneity substantially, and it is most desirable that the liquid crystallinity compound is being fixed by the polymerization reaction. As for the orientation of a liquid crystallinity compound, it is desirable to make it homogeneous orientation.

[0024] As a cylindrical liquid crystallinity compound, azomethines, AZOKISHI, cyano biphenyls, cyanophenyl ester, benzoates, cyclohexane-carboxylic-acid phenyl ester, cyanophenyl cyclohexanes, cyano permutation phenyl pyrimidines, alkoxy permutation phenyl pyrimidines, phenyl dioxanes, tolan, and alkenyl cyclohexyl benzonitriles are used preferably. Not only the above low-molecular-liquid-crystal nature compounds but a polymer liquid crystal nature compound can be used.

[0025] As the approach of carrying out orientation of the liquid crystallinity compound, the orientation film can be formed on said phase contrast film, the solution of a liquid crystallinity compound can be developed on the orientation processing front face of this orientation film, for example, and the approach of performing heat treatment and optical processing etc. can be used. Formation of the orientation film has the approach of forming the thin film of a polymer and carrying out rubbing processing of the front face, the desirable approach of carrying out the polarization exposure of this using the optical orientation film, etc. Rubbing processing is carried out by rubbing a polymer thin film front face several times in the fixed direction with paper or cloth. Moreover, as for said polymer thin film, what was manufactured by the solvent cast method is desirable in order to lessen nonuniformity of a birefringence.

[0026] Here, the polymer same as a polymer for orientation film formation as what was mentioned above is mentioned. Moreover, although especially the thickness of the orientation film is not limited, generally, it is desirable that it is 20-500nm, it is 50-200nm more preferably, and it is 50-100nm especially preferably. Moreover, what is necessary is for a desired phase contrast value just to determine it more generally than turbulence of orientation, and the point of prevention of permeability lowering, although the thickness of the liquid crystal layer formed on the orientation film is 0.1-10 micrometers.

[0027] In addition, although the number of laminatings of said liquid crystal layer is arbitrary, the viewpoint which controls lowering of the permeability by absorption loss, the reflection loss in a

laminating interface, etc. or visibility is considered, and it is further determined in consideration of the wavelength dispersion of an optical property. It is necessary to choose the number of laminatings of lambda/2 plate and lambda/4 plate according to an optical property.

[0028] In order to raise an adhesive property in a laminating with the birefringence layer which consists of a phase contrast film and a liquid crystallinity compound, surface treatment, such as glow discharge processing, corona discharge treatment, ultraviolet-rays (UV) processing, and flame treatment, may be performed to the front face of a phase contrast film, and/or the front face of a liquid crystal compound layer. Moreover, proper adhesion means, such as a binder, can also be used for a laminating.

[0029] It is desirable to face to carry out the laminating of the polarizing plate to the above-mentioned compound presentation phase differential plate, and to carry out the laminating of the polarizing plate to the layer which has 1/2 wave of phase contrast value of the light among the layers which constitute a compound presentation phase differential plate. By taking such arrangement, it becomes possible to produce the circular polarization of light plate of a broadband. Therefore, when a phase contrast film has the phase contrast of the quarter-wave length of the light, [for example,] The laminating of the birefringence layer (lambda/4 plate) which has the phase contrast value of the quarter-wave length of the light which moreover consists of a liquid crystallinity compound is carried out. Furthermore, the laminating of the birefringence layer (lambda/2 plate) which has 1/2 wave of phase contrast value of the light which consists of liquid crystallinity compounds is carried out, it considers as a compound presentation phase differential plate, and the laminating of the polarizing plate is carried out to this liquid crystal layer (lambda/2 plate). Moreover, when a phase contrast film has 1/2 wave of phase contrast of the light, [for example,] The birefringence layer (lambda/2 plate) which has 1/2 wave of phase contrast value of the light which consists of liquid crystallinity compounds is formed, and the laminating of the birefringence layer (lambda/2 plate) which has further 1/2 wave of phase contrast value of the light which consists of liquid crystallinity compounds is carried out, it considers as a compound presentation phase differential plate, and the laminating of the polarizing plate is carried out to said phase contrast film. Therefore, a phase contrast film can also be operated as a protection film of one side of a polarizing plate.

[0030] Moreover, laminating arrangement with a polarizing plate and a compound presentation phase differential plate can be set as arbitration.

[0031] A polarizing plate consists of what pasted up the transparence protection film which serves as a protective layer through a proper glue line at one side or the both sides of a polarization film. As a polarization film, the polarization film which especially definition does not have, for example, consists of a polyene oriented film like the thing and the dehydration processing object of polyvinyl alcohol which the hydrophilic high polymer film like a polyvinyl alcohol (PVA) system film, a partial formal-ized polyvinyl alcohol system film, and an ethylene-vinylacetate copolymer system partial saponification film was made to adsorb, and extended iodine and/or dichromatic dye to it, or the demineralization acid-treatment object of a polyvinyl chloride etc. is raised. Especially, the polyvinyl alcohol system film to which adsorption orientation of iodine or the dichromatic dye was carried out is desirable. Although especially the thickness of a polarization film is not limited, its 1-80 micrometers are common, and its 2-40 micrometers are especially desirable. In addition, the transparency shaft of a polarization film corresponds in the direction vertical to the drawing direction of a film.

[0032] A proper bright film can be used as a protection film raw material used as the transparent protection layer prepared in one side or the both sides of a polarization film. The film which consists of a polymer which is excellent in transparency, a mechanical strength and thermal stability, moisture electric shielding nature, etc. especially is used preferably. As an example of the polymer, although the acetate system resin like triacetyl cellulose, polyester system resin, polyether sulphone system resin, polycarbonate system resin, polyamide system

resin, polyimide system resin, polyolefine system resin, acrylic resin, etc. are raised, it is not limited to this. As for the protective layer, the front face may be formed in detailed irregularity structure of content of a particle.

[0033] The transparence protection film which can be used especially more preferably than points, such as a polarization property and endurance, is a triacetyl cellulose film which carried out saponification processing of the front face with alkali etc. Although the thickness of a transparence protection film is arbitrary, generally it is especially set to 5-150 micrometers preferably 5-300 micrometers 500 micrometers or less for the purpose of thin-shape-izing of a polarizing plate etc. In addition, when preparing a transparence protection film in the both sides of a polarization film, the transparence protection film which consists of a polymer which is different on the front reverse side may be used. Moreover, as mentioned above, the aforementioned phase contrast film may be used as a protection film of one side of a polarizing plate.

[0034] Especially adhesion processing with a polarizer and the transparence protection film which is a protective layer can be performed through the adhesives which consist of a water-soluble cross linking agent of vinyl alcohol system polymers, such as adhesives which consist of an acrylic polymer or a vinyl alcohol system polymer or a boric acid and a borax, glutaraldehyde, and a melamine, oxalic acid, at least, for example, although not limited. Thereby, it shall be hard to separate under the effect of humidity or heat, and shall excel in light transmittance or degree of polarization. Although this glue line is formed as a spreading desiccation layer of a water solution etc., it can also blend other additives and the catalyst of an acid etc. if needed on the occasion of preparation of the water solution. It is desirable to use the adhesives which consist of polyvinyl alcohol from the point of excelling in an adhesive property with a PVA film especially.

[0035] Especially the approach of carrying out the laminating of a polarizing plate and the compound presentation phase differential plate is not limited, and if transparency is high, adhesives, a binder, etc. can be suitably used for it. After carrying out sequential formation of the birefringence layer which has the phase contrast of the birefringence layer which forms the orientation film as the other approaches on the polymer film used as a protective layer of a polarizing plate, and has 1/2 wave of phase contrast on it, or quarter-wave length, it is also possible to carry out the laminating of the phase contrast film in the lamination by adhesives or the binder on it. Then, what is necessary is to paste up a polymer film with a polarization film and to paste up only a polymer film on another side.

[0036] Moreover, on the occasion of the laminating of a polarizing plate and a compound presentation phase differential plate, it can carry out through a glue line etc. As adhesives (binder) used for a laminating, there is especially no definition, for example, it can use proper adhesives, such as transparent pressure sensitive adhesives, such as acrylic, a silicone system, a polyester system, a polyurethane system, a polyether system, and a rubber system. What does not require a hot process in the case of hardening or desiccation is desirable, and what does not require hardening processing or the drying time of long duration is more desirable than the point of preventing change of optical properties, such as an optical film. Moreover, what does not produce exfoliation etc. is preferably used for the bottom of heating or a humidification condition.

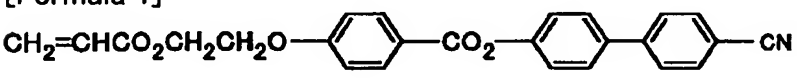
[0037] The acrylic pressure sensitive adhesive which is obtained from this point by carrying out the polymerization of the monomers, such as butyl acrylate (meta), a methyl acrylate (meta), an ethyl acrylate (meta), and an acrylic acid (meta), and with which mass average molecular weight consists of an acrylic polymer 100,000 or more and not more than glass-transition-temperature 0 degree C is used especially preferably. Moreover, an acrylic pressure sensitive adhesive is desirable also from the point of excelling in transparency, weatherability, thermal resistance, etc. In addition, when carrying out the laminating of that from which a refractive index differs, the adhesives which have the refractive index of an inside question are preferably used from points,

such as control of reflection loss.
[0038] Proper additives, such as a bulking agent which consists of the resin of a natural product or a compost, a glass fiber, a glass bead and a metal powder, other inorganic powder, etc., a pigment and a coloring agent, and an antioxidant, can also be blended with adhesives if needed. Moreover, it can also consider as the adhesives layer which is made to contain a particle and shows optical diffusibility.
[0039] Although the compound presentation phase differential plate and circular polarization of light plate of this invention are effectively used as lambda/4 plate for acid resisting of a reflective mold liquid crystal display or an organic electroluminescence display Although it can form on the occasion of the practical use also by carrying out the laminating of a compound presentation phase differential plate or the circular polarization of light plate separately one by one in the manufacture process of each display, by carrying out a laminating beforehand, it excels in stability, laminating workability, etc. of quality, and there is an advantage in which the manufacture effectiveness of each display is raised and it deals.
[0040] The adhesive layer for pasting the compound presentation phase differential plate and polarizing plate which were mentioned above with other members, such as a liquid crystal cell, can also be prepared. The adhesive layer can be formed with the proper binder according to the former, such as acrylic. It is desirable to carry out tentative installation covering with a separator for the purpose of a pollution control etc. until it presents practical use with the adhesive layer, when the adhesive layer prepared in the polarizing plate or the optical film is exposed to a front face. A separator can be formed with the method which establishes the exfoliation coat by proper removers, such as a silicone system, a long-chain alkyl system, a fluorine system, and a molybdenum sulfide, in the proper Japanese tissue object according to the above-mentioned transparence protection film etc. if needed.
[0041] In addition, above-mentioned each class, such as a phase contrast film, a liquid crystal layer, a polarizer and transparent protection layer, and an adhesives layer, can also give ultraviolet absorption ability with the method processed with ultraviolet ray absorbents, such as for example, a salicylate system compound, a benzo phenol system compound, a benzotriazol system compound, a cyanoacrylate system compound, and a nickel complex salt system compound.
[0042] The compound presentation phase differential plate and circular polarization of light plate of this invention can be used for formation of various equipments, such as a liquid crystal display and an organic electroluminescence display. It can use for the reflective mold and the transflective type liquid crystal display which come to arrange a polarizing plate on one side or the both sides of a liquid crystal cell especially, the flat-surface display equipped with the organic electroluminescence display cel, etc. preferably. In addition, to mount the compound presentation phase differential plate of this invention in a liquid crystal cell, it is necessary to make it the design in consideration of the birefringence by the orientation of liquid crystal, and to adjust suitably whenever [with a polarizing plate / phase contrast value / of lambda/2 plate and lambda/4 plate / and crossed-axes-angle].
[0043] Specifically, proper liquid crystal displays, such as a liquid crystal display which has arranged the polarizing plate on one side or the both sides of a liquid crystal cell, and a thing which used the back light or the reflecting plate for the lighting system, can be formed. As for a phase contrast film, in the case of the liquid crystal display using a polarizing plate, it is more desirable than the point of acid resisting etc. to arrange between a liquid crystal cell, a polarizing plate, especially the polarizing plate by the side of a check by looking. Furthermore, on the occasion of formation of a liquid crystal display, proper components, such as a prism array sheet, a lens array sheet, an optical diffusion plate, and a back light, can be arranged one layer or more than two-layer in a proper location, for example.

[Translation done.]

EXAMPLE

[Example] Hereafter, this invention is explained still more concretely using an example and the example of a comparison.
[0045] (Example 1) as the 1st layer -- 100 micrometers in thickness, width of face of 500mm, and die length of 500m -- optically, uniaxial stretching of the isotropic roll-like norbornene film (photoelastic coefficient: 5x10-13m2/N) was carried out at 175 degrees C, and the phase contrast film was obtained. The phase contrast value (**nd) of a phase contrast film was 270nm (measurement wavelength: 560nm).
[0046] Next, on this phase contrast film, as the 2nd layer, the polyvinyl alcohol (NHmade from Japanese synthetic chemistry- 18) water solution of 1 mass % was applied, it dried at 90 degrees C, and the coat of about 0.01 micrometers or less of thickness was formed. Rubbing processing of the front face was carried out in the 27.5-degree direction to the longitudinal direction of a film, and the orientation film was formed. After producing the reactant cylindrical pneumatic liquid crystal of the structure of ** 1, and the mixture of a photopolymerization initiator by the thickness of about 3 micrometers moreover and heat-treating for 1 minute at 90 degrees C, the layer with the phase contrast value of 270nm of phase contrast within a field was obtained by performing ultraviolet-rays bridge formation.
[0047] Furthermore, as the 3rd layer, the polyvinyl alcohol (NHmade from Japanese synthetic chemistry- 18) water solution of 1 mass % was applied, it dried at 90 degrees C, and the coat of about 0.01 micrometers or less of thickness was formed. Rubbing processing of the front face was carried out in the 93.5-degree direction to the longitudinal direction of a film, and the orientation film was formed. After producing the reactant cylindrical pneumatic liquid crystal of the structure of ** 1, and the mixture of a photopolymerization initiator by the thickness of about 1.5 micrometers on it and processing between 1-minute heat at 90 degrees C, the layer with the phase contrast value of 140nm of phase contrast within a field was obtained by performing ultraviolet-rays bridge formation.
[0048]
[Formula 1]



[0049] The acrylic pressure sensitive adhesive (NITTO DENKO make) was used for the 270nm side of the obtained compound presentation phase differential plate, and lamination and a circular polarization of light plate were produced for the polarizing plate ("SEG1425DU" by NITTO DENKO). The configuration of this circular polarization of light plate is shown in drawing 2 . In the include angle of the polarization shaft of a polarizing plate 4, and the lagging axis within the field of lambda / 2 phase-contrast film 1 (the extension direction), the include angle of 6.5 degrees, a polarizing plate 4, and the lagging axis within the field of lambda / 2 liquid-crystal coating layer 2 (the direction of rubbing) set the include angle of 34 degrees, a polarizing plate 4, and the lagging axis within the field of lambda / 4 liquid-crystal coating layer 3 (the direction of

machine), the rate of a birefringence (deltan) in four waves (481nm, 550nm, 632nm, 754nm) was measured, and the ratio to the rate of a birefringence in 550nm (deltan550) was asked for and plotted. The result is shown in drawing 1 . Although lambda/4 conventional plate functions as a quarter-wave length plate to light with a wavelength of about 550nm, except the wavelength region, it turns out that it is not functioning, so that clearly from drawing 2 . On the other hand, it turns out that the compound presentation phase differential plate of an example 1 is functioning as a quarter-wave length plate over a large wavelength region.

[Translation done.]

DESCRIPTION OF DRAWINGS

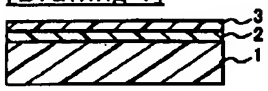
[Brief Description of the Drawings]
[Drawing 1] It is the sectional view showing the example of a configuration of the compound presentation phase differential plate of this invention.
[Drawing 2] It is drawing showing the example of a configuration of the circular polarization of light plate of this invention.
[Drawing 3] It is drawing showing the engine performance (wavelength dispersion value) of the compound presentation phase differential plate of this invention.
[Description of Notations]
1 Lambda/2 Plate (Phase Contrast Film)
2 Lambda/2 Plate (Liquid Crystal Layer)
3 Lambda/4 Plate (Liquid Crystal Layer)
4 Polarizing Plate
The polarization shaft of the polarization version
b The lagging axis within the field of lambda/2 plate (phase contrast film)
c The lagging axis within the field of lambda/2 plate (liquid crystal layer)
d The lagging axis within the field of lambda/4 plate (liquid crystal layer)

[Translation done.]

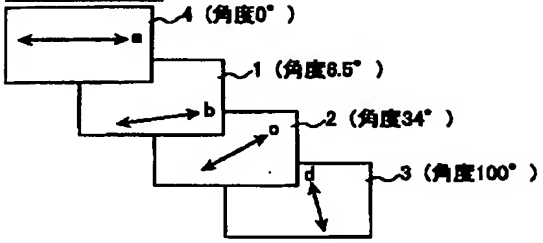
* NOTICES *

DRAWINGS

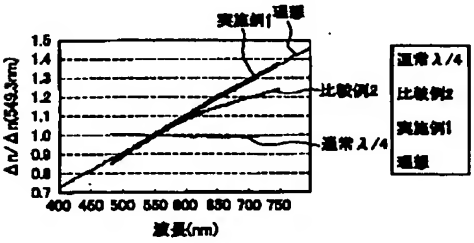
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Translation done.]